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## A QUARTET IN E

### *Investigating Collaborative Learning and Tutoring as Knowledge Creation Processes*

**Abstract.** This paper is a short report of a continuing international study that is investigating networked collaborative learning among an advanced community of learners engaged in a master's programme in e-learning. The study is undertaking empirical work using content analysis (CA), critical event recall (CER) and social network analysis (SNA). The first two methods are employed in the work reported in this paper. We are particularly interested in knowledge creation among the participants as they engage in action research for their master's work. At the same time, another underlying aim of the main study is to develop methodology, enrich theory and explore the ways in which praxis (theory informed tutoring and learning on the programme) and theory interact as we try to understand the complex processes of tutoring and learning. The paper reports some of the current findings of this work and discusses future prospects.

Key words: collaborative learning tutoring content analysis critical event recall knowledge creation

### 1. INTRODUCTION

This paper reports an extract from an empirical study of networked learning that embraces two overall aims. Firstly to investigate and develop a more complete understanding of the complex tutoring and learning processes of networked collaborative learning communities through a conversation with theory. Secondly, to contribute to the enrichment of our theoretical and methodological tools.

We have argued elsewhere (De Laat & Lally, 2003) that the nature of praxis (theory-informed tutoring and learning) in networked environments is so complex that no single theoretical model, among those currently available, is sufficiently powerful to provide a framework for a research agenda that takes into account the key aspects of human agency. Furthermore, we have also argued that this complexity of praxis requires a multi-method approach to empirical investigation, in order that theory and praxis may 'converse', with both being enriched by these investigations. On an empirical level, and as an example that draws upon our theoretical argument about complexity, we present, in this short paper, examples of the findings of a multi-method analysis of the learning and tutoring processes occurring in an on-line community of professionals engaged in a Master's Programme in E-Learning. This investigation is informed by two mainstream theoretical perspectives on learning, and employs computer-assisted content analysis (CA) and critical event recall (CER) as complementary methodologies. This study reveals the differentiated nature of participants' learning, even within a highly structured collaborative learning environment, identifies some of the key functions and roles of participants, and provides an indication of the value of such multi-method studies. Future prospects for this approach to research in the field are considered.

### 2. THEORETICAL COMPLEXITY AS A BASIS FOR UNDERSTANDING COMPLEX LEARNING AND TUTORING PROCESSES

Arising from our earlier argument about the complexity of tutoring and learning processes, we contest that there is a need to draw on a plurality of theoretical perspectives in order to develop both theory and praxis through a 'conversation' between them, mediated by multi-method analysis. In this section we outline briefly some of the key theoretical ideas upon which our recent work, and the present paper, are based. We also indicate how the overall direction of the work draws upon each of these ideas, and the kinds of analysis to which each perspective has led us. In this work (for example Barrett & Lally, 1999; De Laat, De Jong, & Simons, 2001; De Laat, De Jong, & Ter Huurne, 2000; Lally & De Laat, 2002; Lally & Barrett, 1999) we have explored a range of aspects of collaborative learning and developed analytical frameworks in order to understand the complex tutoring and learning processes that are occurring in learning communities. We contend that the interaction between tutoring and learning processes is of central importance in all educational endeavours. Therefore, one of our central aims is to enquire systematically

into this key educational interaction. Unless we make rich links between tutoring processes and students' learning processes it is difficult to fully understand or improve these processes. Sotto (1996) has argued this point very cogently: that good tutoring in higher education is far from self-evident, and that its connection to learning is complex, both in terms of learning outcomes at the end of an event, and learning processes occurring during that event.

### *2.1 Constructivism, situativity, and group learning*

We have premised the analysis and theorising in the present paper by drawing on several theoretical perspectives about learning. One of these is a social-constructivist view of learning that also considers the situativity of learning processes. This leads us to focus on a search for evidence, in the online discussions, of cognitive processes in which participants link new knowledge to their prior knowledge, and actively construct new internal representations of the ideas being presented (Boekaerts & Simons, 1995). We also draw on ideas about the meaningfulness and situativity of learning. That is, we view learning as a set of processes by which the learner personalises new ideas by giving meaning to them, based upon earlier experiences. However, meaning is also rooted in, and indexed by experience (Brown, Collins, & Duguid, 1989). Therefore, each experience with an idea, and the environment of which that idea is part, becomes part of the meaning of that idea (Duffy & Jonassen, 1992). Learning is therefore understood and viewed by us as situated by the activity in which it takes place (Brown et al., 1989; Lave & Wenger, 1991). This view has led us to also seek evidence in the online texts, using a learning coding schema, for the cognitive, social and affective processes in which participants engage in trying to make meaning of the ideas presented to them by the tasks they are undertaking. We have also used Critical Event Recall (CER) to try to access the meaning making, and awareness of context, that participants use to make judgements and engage in activities in their course of study.

### *2.2 Socio-cultural theory*

The other perspective that we have drawn upon is socio-cultural theory. According to this perspective, learning cannot be understood as a process that is solely in the mind of the learner (Van Boxtel, Van der Linden, & Kanselaar, 2000). Knowledge is constructed in settings of joint activity (Koschmann, 1999). Learning is a process of participating in cultural practices, a process that structures and shapes cognitive activity (Lave & Wenger, 1991). The socio-cultural perspective gives prominence to the aspect of mutuality of the relations between members and emphasises the dialectic nature of the learning interaction (Sfard, 1998). Construction of knowledge takes place in a social context, such as might be found in collaborative activities of the MEd in E-Learning featured in this paper (see McConnell, 2000 for a much more detailed exploration of collaborative learning). In collaborative learning it is necessary to formulate learning objectives, to make learning plans, to share information, to negotiate about knowledge and to take decisions (Veldhuis-Diermanse, 2002). In a setting of collaborative learning, students can criticise their own and other students' contributions, they can ask for explanations, they can give counter arguments and, in this way, they will stimulate themselves and the other students. Additionally, they can motivate and help each other to finish the task. Arising from our interest in these ideas is a need to focus on tutoring processes, that is the processes of interaction by which participants guide, facilitate and structure the contributions of others, and in so doing modify and develop their own learning processes. To probe the online texts for evidence of these processes we have employed a second coding schema to explore tutoring processes.

In conclusion, we contend that this complex collection of theoretical ideas, drawing on social-constructivist and socio-cultural theory, and ideas about situativity, is necessary to take account of the real complexities of individual and group processes in the networked learning context that is the focus of our study.

## 3. METHODS AND SAMPLE

In this paper we look at a small sub-set of our findings from the application of computer assisted content analysis (Popping, 2000) to asynchronous discussion transcripts of the E-Learning MEd at the University of Sheffield. The empirical findings in this paper arise from our focus on the content analysis of the contributions of four participants (the 'E-Quartet' in our title). This is integrated with the use of Critical

Event Recall (CER) to probe learning and tutoring processes that may not be expressed in the actual text records used as data for the content analysis. The MEd is an advanced part-time programme designed to provide participants with opportunities to engage with theory and praxis of collaborative networked tutoring and learning. The programme is based upon the establishment of a 'research learning community' among the participants and tutors. In this community activities are undertaken around five workshops over a two-year period. The programme is hosted in the electronic learning environment WebCT. In the course they become engaged in collaborative learning and tutoring processes (McConnell, 2000) as they support each other and the group as a whole in a range of structured activities. Tutoring processes in this course are not the exclusive domain of the designated tutors. They may be undertaken by any of the participants in this course environment.

The analysis presented here is based upon work conducted by 3 students and a tutor in the first workshop of this programme (approximately 10 weeks' duration). We were particularly interested to explore the relationship between knowledge construction (learning) and tutoring processes as these evolved over time within the workshop.

### *3.1 Content Analysis*

In the process of analysing tutoring and learning processes of the participants in our group, messages from the workshop had to be coded and analysed. The central purpose of coding, for us, was to extract, generalise and abstract from the complexity of the original messages in order to look for evidence of these processes, and use this to interrogate the theories about the situation that we had used to direct our investigation. We used computer assisted data analysis software (CAQDAS) to achieve this. Each message was imported as a text file and given a 'time-stamp' to indicate when it was posted in the original discussions in WebCT. It was also given other 'descriptors' including who authored the message, and the gender of the author. Once all the messages had been coded and described we used the search facility in NVivo to carry out the analyses. The results in this paper are based on one of these analyses: a search, by individual participant, for his or her contributions within each category of the learning and tutoring coding schemas.

In order to probe collaborative knowledge construction and tutoring in this learning environment we 'coded' the contributions made to a 10 week discussion using two coding schemas. The coding process consisted of two steps: (1) dividing the messages into meaningful units (Creswell, 1998; Henri, 1992) and (2) assigning a code to each unit. The first coding schema (based on Veldhuis-Diermanse, 2002) was used to investigate knowledge construction processes of the four individuals. Additionally, some of the codes are targeted on processes that are social, and occur between individuals. Examples of these types of code include the metacognitive codes used to mark expressive, questioning, explaining, and sharing of ideas. The second schema focuses on units of meaning that are 'around the task'. We have called these tutoring processes and to probe them we adapted another published coding schema (Anderson, Rourke, Garrison, & Archer, 2000). This includes three main sub-categories: design and organisation, facilitation of discourse and direct instruction. The intention here was to reveal something of the ways in which the participants were supporting each other's learning, and learning together, while undertaking the task.

### *3.2 Critical Event Recall (CER)*

This method is a form of 'stimulated' event recall (Interpersonal Process Recall - IPR). It is a process based on the realisation that humans store vast amounts of information, feeling, impressions and ideas about the events, or 'interpersonal processes', in which they have participated (Kagan & Kagan, 1991). Because of the speed at which human interactions occur much of the detail of these processes is soon 'forgotten', and not available for subsequent reflection. When groups of participants engage in mutual or shared recall of events in which they have been present together they can gain insight into their behaviour and learning processes. In a sensitively guided recall this can be of benefit for the future learning of the group, as well as the individuals within it. The recall enables the articulation of many previously unexpressed aspects of learning.

In networked collaborative learning environments such as the Sheffield E-Learning M.Ed. Programme (University of Sheffield, 2001), students and tutors are working in learning communities with many complex learning interactions occurring simultaneously. The use of the records of these interactions as a stimulus to recall of critical learning events occurring during the programme workshops suggests itself as a

way of investigating those aspects of these processes not actively expressed during the events. We have termed this critical event recall, and adopted two approaches to undertaking it. In the first approach the participant is presented with summary analyses of the group and individual learning events. These give an overview of the patterns of learning and tutoring within the event (as presented in tables one and two of this paper). In the second approach we use the full text of learning events. In both approaches the participant was presented with these items in advance of the recall sessions so that they might familiarise themselves with the summary analyses and full text of the events.

In this paper we include small samples of the recall events of four participants - the university tutor (Brian) and three students (Bill, Andrea and Charles), using summary analyses and full texts from which they were able to choose what, for them, were the *critical events* of the workshop. The student participants were chosen because they represented a range of participation profiles: (a) increasing over the ten week period (Bill); (b) decreasing over the ten week period (Charles), and (c) providing high levels of facilitation to other students (Andrea).

#### 4. RESULTS

The results presented here represent a small sample of our content analysis and critical event recall work with the 'E-Quartet' of participants. Tables one and two show summary results for learning processes (Table 1) and tutoring processes (Table 2) for the first ten days of the ten week workshop that we investigated. Similarly, the CER extracts are taken from the early stages of the interviews, when the four participants are recalling the first ten days of the work. Together these results give a flavour of the kinds of evidence provided by the combination of these methods.

##### 4.1 Content Analysis Tables

*Table 1 Units of Meaning Coded for Learning Processes During the Beginning Phase (note: pseudonyms are used here and in the rest of this paper)*

<i>Type of Learning Process</i>	<i>Bill</i>	<i>Brian*</i>	<i>Andrea</i>	<i>Charles</i>	<i>Total</i>
<i>Cognitive</i>	<i>0</i>	<i>4</i>	<i>17</i>	<i>11</i>	<i>32</i>
<i>Affective</i>	<i>0</i>	<i>1</i>	<i>4</i>	<i>3</i>	<i>8</i>
<i>Metacognitive</i>	<i>0</i>	<i>1</i>	<i>4</i>	<i>4</i>	<i>9</i>
<i>Miscellaneous</i>	<i>1</i>	<i>1</i>	<i>2</i>	<i>1</i>	<i>5</i>
<i>Total</i>	<i>1</i>	<i>7</i>	<i>27</i>	<i>19</i>	<i>54</i>

*Table 2 Units of Meaning Coded for Tutoring Processes in the Beginning Phase*

<i>Type of Tutoring Process</i>	<i>Bill</i>	<i>Brian*</i>	<i>Andrea</i>	<i>Charles</i>	<i>Total</i>
<i>Direct Instruction</i>	<i>0</i>	<i>2</i>	<i>0</i>	<i>0</i>	<i>2</i>
<i>Facilitation</i>	<i>1</i>	<i>8</i>	<i>5</i>	<i>5</i>	<i>19</i>
<i>Instructional Design</i>	<i>2</i>	<i>8</i>	<i>4</i>	<i>8</i>	<i>22</i>
<i>Total</i>	<i>3</i>	<i>18</i>	<i>9</i>	<i>13</i>	<i>43</i>

#### *4.1 Critical Event Recall Excerpts and Interpretation*

##### *4.1.1 Brian's Recall*

Brian commented that the tables showed him to be much more active at the start and end of the workshop, and much less so in the middle phase:

"That was certainly an active conscious decision. Because I knew that throughout, I had that as a sort of personal policy, to be there at the start and give them the space in the middle, and to come back in the end."

"I am not surprised with that because I not only had that personal policy of starting with the profile and ending with a higher profile, but I also had a personal policy of explaining that policy to them as part of my personal philosophy. So I said to them that I'd try to be there at the start to clarify the task and everything, left it to them in the middle and then be here again at the end, talking about 'how was it for you' kind of thing."

These excerpts illustrate the decision he made to be much more visible to the other participants at both the beginning and ending phase of the event, but to withdraw to a large extent in the middle phase of work. He went on to explain his thinking behind this strategy, and how it related to the way in which he wanted to give space to participants to work together and express their own ideas, not dominated by him. This revealed strategic pedagogic thinking about his role as a tutor and facilitator with special responsibilities (he represented the university in the group). It was clearly intended to support the learning processes of other group members, but was not expressed in the discussions of this particular group.

##### *4.1.2 Bill's Recall*

Bill was very aware of the centrality of Brian's role in guiding the group's processes:

"What Brian did was part facilitation and part guiding on the topic; he brought to our attention that we should focus on the topic but also on the process. I thought at the time that it was good that he did that; we would have ended up, probably, with a project of some sort, but we needed that reminder from Brian. It might otherwise have been more product-based and with not so much emphasis on the process. It was time for some intervention. At the time he made us think of the group issues and group project, and that they are just as important as the final product."

"Yeah, and I think that that is a skill that Andrea has got. And in the end of her message she is asking if any of these models could fit in. So she is not saying what we should do; to me that was an opening up a issue for discussion, trying to draw other people in."

These excerpts show that Bill was very aware that Brian understood the importance of the processes of the group. At the same time, he was also conscious that Andrea was a central character as far as facilitation was concerned.

#### *4.1.3 Andrea's Recall*

Andrea was a self-effacing group member; it was clear from the data on participation that she was a major contributor, with much experience of on-line collaborative work.

"I was very much surprised at my cognitive contributions. If you had asked me I would have put the much lower. At the time I didn't think I knew what I was doing. I was very much in new territory. I was surprised that I had made the biggest contributions overall to learning at this point."

Despite this modest assessment of her role, Bill and Charles quickly realised that she was central to the success of their project.

#### *4.1.4 Charles' Recall*

Charles knew that Andrea's facilitation was important:

"Andrea was extremely active and influential in the group. She was driving the project along. I also had experience of the material for that part of the project, so I proposed things."

"At the very beginning of the project I was apprehensive about how it might take off. I was quite pleased that my proposal about the intranet resources was taken up. It received a positive reaction from the rest of the group. Now we had something on the table. I enjoyed this workshop enormously."

"I have been working on e-learning issues in my own work, so in the early phase of the workshop I was quite comfortable, once the project began to move in that direction."

He was hesitant, but had a sense that his own suggestions and expertise had contributed to the progress of his group.

## 5. GENERAL DISCUSSION AND CONCLUSIONS

The CA tables show that in the beginning phase of the group's work cognitive learning processes were dominant. The participants were thinking through the basic ideas that they needed to progress their work. The central participant was the student Andrea, though she was modest about her importance in this role. Instructional design was the most important tutoring activity at this early stage of the group's work, and the university tutor took a lead in this set of processes.

This paper has attempted to address some of the complexities of researching networked learning (NL) in a higher education context on both theoretical and empirical levels by linking a theoretical discussion with an example of our recent work. Specifically, we are concerned to illuminate how theory and praxis interact in a range of networked learning environments with a view to enriching both. We describe this interaction as a kind of exploratory conversation between theory and praxis that may be mediated by methodology. We argue that there are several complexities in this endeavour. Firstly, while acknowledging the power of theory as a framework for both pedagogy and research, we suggest that the complexity of praxis in networked collaborative learning environments is such that the models of social-constructivism, situated learning and socio-cultural theory are not, separately, capable of providing an account of the role of meaning making, the function of context or the power of the interaction between tutoring processes and learning processes. We have therefore drawn on all of these frameworks in this account of individual learning and tutoring, that is, we have used them as a means of thinking about the kinds of processes that might form a meaningful focus for our enquiry. Secondly, we acknowledge that the complexity of praxis is such that the empirical work reported here can focus only on a sub-set of the aspects of human agency that are pertinent to a holistic understanding of collaborative educational contexts. In this study we have chosen learning and tutoring processes as the focus of our research because we think that they are central to the pedagogical endeavour (a view informed by the theoretical perspectives upon which we have drawn in this study). However, it is also clear that richer theoretical descriptions than those we have employed may be required to take account simultaneously of more aspects of agency. For example,

we have taken little account of individual and group motivation, although some features of the tutor's motivations are apparent in the CER interview. Thirdly, we argue that the complexity of the tutoring and learning processes that we encountered in the E-Learning MEd are such that a multi-method approach is required to mediate the conversation between theory and praxis.

Empirically, this paper reports part of an attempt to study both learning processes and tutoring processes within a group of four collaborating professionals in an on-line learning community. We have presented the results of an approach to content analysis of messages exchanged during a single professional development activity of approximately ten weeks duration. This analysis has enabled the tentative identification of patterns of individual and group learning during the activity. It has also allowed us to discern different individual roles in tutoring processes among these professionals (as revealed through coding of units of meaning and the CER interviews). We have tentatively attempted to relate these to learning processes. We suggest that these analyses have added to our understanding of tutoring and learning processes by professionals in a learning community within an on-line Master's Programme. They show, for example, how participants may operate quite differently, and yet within discernible patterns, some being strong facilitators, while others offer little support to their collaborators. There are many other implications in terms of differentiated patterns of working that we hope to articulate in future work. Through this approach we contend that it may be possible to gain deeper insights into how professionals collaborate successfully to develop their own practice, and into the complexity of the interactions between individual and group processes during these collaborations.

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